CLAIMS

1-20. (Cancelled)

21. (Currently Amended) A method of ~~determining~~ routing, along a path between an ingress node and an egress node in a packet network, packetized data corresponding to ~~for~~ a new demand, the method comprising the steps of:

(a) generating a graph for the packet network integrating logical and optical layers as nodes and links of the graph, wherein each node of the graph accounts for presence or absence of wavelength conversion within the node;

(b) modifying the graph, if necessary, based on the new demand and any previously routed demands; ~~and~~

(c) determining a route through the modified graph as the path for the new demand;

wherein:

for step (a), each wavelength of an optical link between a pair of nodes is modeled with a corresponding wavelength link in the graph, and

step (b) further comprises the step of replacing a series of wavelength links corresponding to a portion of a provisioned path between a pair of nodes with a cut-through arc; and

(d) providing the determined route to one or more nodes in the packet network to enable the routing of the packetized data along the determined route.

22. (Previously Presented) The invention as recited in claim 21, wherein, for step (a), each router and OXC with wavelength conversion is modeled with at least two sub-nodes and a super-node, wherein each sub-node of a node corresponds to an available wavelength and is coupled to each other sub-node of the node through a super-node.

23. (Previously Presented) The invention as recited in claim 22, wherein for each coupled pair of nodes in the graph, each sub-node having the same wavelength of the coupled pair is coupled with a corresponding link.

24. (Previously Presented) The invention as recited in claim 22, wherein the flow of packets into a node balances the flow of packets out of a node.

25. (Previously Presented) The invention as recited in claim 21, wherein, for step (a), each OXC without wavelength conversion is modeled with at least two sub-nodes, wherein each sub-node corresponds to an available wavelength at the corresponding node in the graph.

26. (Previously Presented) The invention as recited in claim 21, wherein, for step (a), each node and link of the graph is present in the graph based on a residual capacity of each wavelength of each optical link.

27. (Previously Presented) The invention as recited in claim 21, wherein step (a) models i) each node based on whether it is a router, an optical cross-connect (OXC) with wavelength conversion, or an OXC without wavelength conversion, and ii) each available wavelength of an optical link between nodes in the graph with a corresponding link in the graph.

28. (Previously Presented) The invention as recited in claim 21, wherein step (c) includes the step of computing the path through the modified graph via a shortest path routing algorithm.

29. (Previously Presented) The invention as recited in claim 21, wherein, for step (a), at least one of the nodes includes an optical interface, and at least one of the links is an optical link, and the nodes and links are in a wavelength division multiplex communications network.

30. (Previously Presented) The invention as recited in claim 21, wherein step (b) modifies the graph by the steps of:

(b1) eliminating links based on the demand,

(b2) calculating critical links for the graph based on the demand and a residual capacity of each link in the graph,

(b3) weighting links based on the critical links.

31. (Currently Amended) The invention as recited in claim 30, wherein, for step (b2), the critical links are calculated based on a step of estimating an open capacity between pairs of possible ingress and egress nodes in the packet network~~, wherein the step of estimating the open capacity computes the maximum flow value for each of the pairs of possible ingress and egress nodes~~.

32. (Currently Amended) A method of ~~determining~~ routing, along a path between an ingress node and an egress node in a packet network, packetized data corresponding to ~~for~~ a new demand, the method comprising the steps of:

(a) generating a graph for the packet network integrating logical and optical layers as nodes and links of the graph, wherein each node of the graph accounts for presence or absence of wavelength conversion within the node;

(b) modifying the graph, if necessary, based on the new demand and any previously routed demands, by the steps of:

(b1) eliminating links based on the demand,

(b2) calculating critical links for the graph based on the demand and a residual capacity of each link in the graph, and

(b3) weighting links based on the critical links; ~~and~~

(c) determining a route through the modified graph as the path for the new demand; and

(d) providing the determined route to one or more nodes in the packet network to enable the routing of the packetized data along the determined route.

33. (Currently Amended) The invention as recited in claim 32, wherein, for step (b2), the critical links are calculated based on a step of estimating an open capacity between pairs of possible ingress and egress nodes in the packet network~~, wherein the step of estimating the open capacity computes the maximum flow value for each of the pairs of possible ingress and egress nodes~~.

34. (Previously Presented) The invention as recited in claim 32, wherein, for step (a), each node and link of the graph is present in the graph based on a residual capacity of each wavelength of each optical link.

35. (Previously Presented) The invention as recited in claim 32, wherein step (a) models i) each node based on whether it is a router, an optical cross-connect (OXC) with wavelength conversion, or an OXC without wavelength conversion, and ii) each available wavelength of an optical link between nodes in the graph with a corresponding link in the graph.

36. (Previously Presented) The invention as recited in claim 32, wherein step (c) includes the step of computing the path through the modified graph via a shortest path routing algorithm.

37. (Previously Presented) The invention as recited in claim 32, wherein, for step (a), at least one of the nodes includes an optical interface, and at least one of the links is an optical link, and the nodes and links are in a wavelength division multiplex communications network.

38. (Currently Amended) Apparatus for ~~determining~~ routing, along a path between an ingress node and an egress node in a packet network, packetized data corresponding to ~~for~~ a new demand, the apparatus adapted to:

(a) generate a graph for the packet network integrating logical and optical layers as nodes and links of the graph, wherein each node of the graph accounts for presence or absence of wavelength conversion within the node;

(b) modify the graph, if necessary, based on the new demand and any previously routed demands; ~~and~~

(c) determine a route through the modified graph as the path for the new demand;

wherein:

for step (a), each wavelength of an optical link between a pair of nodes is modeled with a corresponding wavelength link in the graph, and

step (b) further comprises the step of replacing a series of wavelength links corresponding to a portion of a provisioned path between a pair of nodes with a cut-through arc; and

(d) provide the determined route to one or more nodes in the packet network to enable the routing of the packetized data along the determined route.

39. (Previously Presented) The invention as recited in claim 38, wherein step (b) modifies the graph by the steps of:

(b1) eliminating links based on the demand,

(b2) calculating critical links for the graph based on the demand and a residual capacity of each link in the graph,

(b3) weighting links based on the critical links.

40. (Currently Amended) Apparatus for ~~determining~~ routing, along a path between an ingress node and an egress node in a packet network, packetized data corresponding to ~~for~~ a new demand, the apparatus adapted to:

(a) generate a graph for the packet network integrating logical and optical layers as nodes and links of the graph, wherein each node of the graph accounts for presence or absence of wavelength conversion within the node;

(b) modify the graph, if necessary, based on the new demand and any previously routed demands, by the steps of:

(b1) eliminating links based on the demand,

(b2) calculating critical links for the graph based on the demand and a residual capacity of each link in the graph, and

(b3) weighting links based on the critical links; ~~and~~

(c) determine a route through the modified graph as the path for the new demand; and

(d) provide the determined route to one or more nodes in the packet network to enable the routing of the packetized data along the determined route.

41. (New) The invention as recited in claim 25, wherein for each coupled pair of nodes in the graph, each sub-node having the same wavelength of the coupled pair is coupled with a corresponding link.

42. (New) The invention as recited in claim 25, wherein the flow of packets into a node at a

wavelength balances the flow of packets out of a node at the wavelength.

43. (New) The invention as recited in claim 21, further comprising the step of routing packetized data along the path.

44. (New) The invention as recited in claim 31, wherein the step of estimating the open capacity computes the maximum flow value for each of the pairs of possible ingress and egress nodes.

45. (New) The invention as recited in claim 21, wherein the method is embodied in a processor of at least one of a route server and a router of a packet network.

46. (New) The invention as recited in claim 33, wherein the step of estimating the open capacity computes the maximum flow value for each of the pairs of possible ingress and egress nodes.

47. (New) The invention as recited in claim 32, further comprising the step of routing packetized data along the path.

48. (New) A computer-readable medium having stored thereon a plurality of instructions, the plurality of instructions including instructions which, when executed by a processor, cause the processor to implement a method for routing, along a path between an ingress node and an egress node in a packet network, packetized data corresponding to a new demand, the method comprising the steps of:

(a) generating a graph for the packet network integrating logical and optical layers as nodes and links of the graph, wherein each node of the graph accounts for presence or absence of wavelength conversion within the node;

(b) modifying the graph, if necessary, based on the new demand and any previously routed demands;

(c) determining a route through the modified graph as the path for the new demand;

wherein:

for step (a), each wavelength of an optical link between a pair of nodes is modeled with a corresponding wavelength link in the graph, and

step (b) further comprises the step of replacing a series of wavelength links corresponding to a portion of a provisioned path between a pair of nodes with a cut-through arc; and

(d) providing the determined route to one or more nodes in the packet network to enable the routing of the packetized data along the determined route.

49. (New) The invention as recited in claim 48, wherein step (b) modifies the graph by the steps of:

(b1) eliminating links based on the demand,

(b2) calculating critical links for the graph based on the demand and a residual capacity of each link in the graph,

(b3) weighting links based on the critical links.

50. (New) A computer-readable medium having stored thereon a plurality of instructions, the plurality of instructions including instructions which, when executed by a processor, cause the processor to implement a method for routing, along a path between an ingress node and an egress node in a packet network, packetized data corresponding to a new demand, the method comprising the steps of:

(a) generating a graph for the packet network integrating logical and optical layers as nodes and links of the graph, wherein each node of the graph accounts for presence or absence of wavelength conversion within the node;

(b) modifying the graph, if necessary, based on the new demand and any previously routed demands, by the steps of:

(b1) eliminating links based on the demand,

(b2) calculating critical links for the graph based on the demand and a residual capacity of each link in the graph, and

(b3) weighting links based on the critical links;

(c) determining a route through the modified graph as the path for the new demand; and

(d) providing the determined route to one or more nodes in the packet network to enable the routing of the packetized data along the determined route.